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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/694,955	10/29/2003	Dae Sung Seo	1751-344	6164

6449 7590 09/23/2004

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EXAMINER	
PAREKH, NITIN	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 09/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/694,955	SEO, DAE SUNG	
	Examiner	Art Unit	
	Nitin Parekh	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 October 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. Figures 1-3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims.

A. The limitations as recited in claim 6 include "wherein holes for firm solder connection at the tips of the leads which are encapsulated by the EMC".

Therefore, the holes 136 in Fig. 6 or 8 must be shown as being encapsulated or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing

should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> **(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.**

4. Claims 1 and 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art (APA) in view of Fukaya (US Pat. 5969411).

Regarding claims 1, 8-10, the APA discloses micro lead frame (MLF) package/MLFP (see 10 in Fig. 1-3) comprising:

- a semiconductor die/chip (not numerically referenced in Fig. 1-3) within the MLFP
- the MLF having a die pad (16 in Fig. 3), leads formed along the outer sides of the die pad (14 in Fig. 3), and tie bars (not numerically referenced- see Fig. 3) for supporting four corners of the die pad
- an epoxy molding compound (EMC 12 in Fig. 1-3) for encapsulating the semiconductor chip, the MLF and the wires, and
- the die pad, the leads, and the tie bars being coplanar after being encapsulated by the EMC and are exposed outward

(APA: Fig. 1-3; specification pages 1 and 2).

The APA fails to teach:

- the semiconductor die/chip being mounted via adhesive means and having wires being connected with the leads of the MLF, and
- the die pad, the leads, and the tie bars having an oblique etching portion.

Fukaya teaches a LFP where a chip (38 in Fig. 5) is adhesively mounted on a die pad (see Fig. 5; Col. 4, line 66) and is connected with respective leads of the LFP via bonding wires (see 40A/40B in Fig. 5). Fukaya further teaches the die pad and the leads having an oblique/curved etching profile/portion (see Ra/Rb and 36A/36B/32 in

Fig. 5) to improve the lead cutting (Col. 3, line 65- Col. 5, line 63; Col. 7) and the LFP structure having the die pad leads and tie bars (Col. 7, lines 22-32). Such etching profile/portion has a dimension/size of the oblique etching portion in a bottom surface of the leads being greater than that of an upper surface (see Fig. 5).

Furthermore, parameters such as length/width and thickness of leads, shape/profile of a cross-section of die pad/leads/tie bars and respective dimensions, number of leads, diameter of through-holes in a substrate, number of through-holes, spacing/pitch, and a range of such dimensions in chip/LFP packaging and encapsulation technology art is a subject of routine experimentation and optimization to achieve the desired package dimension, weight, bonding strength, reduced level of mechanical/thermal stress and improved reliability and performance.

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the semiconductor chip being mounted via adhesive means, the chip having the wires connecting respective leads; the die pad and the leads/tie bars having an oblique etching portion and select the size of the oblique etching portion in the bottom surface of the MLF being greater than that of the upper surface by about 1-10% as taught by Fukaya so that lead deformation can be prevented, and the lead cutting can be improved in the APA.

Regarding claim 11, forming the upper/lower surfaces of the MLF/leads do not distinguish over the APA and Fukaya, because only the final product/structure is relevant, not the process of forming the upper/lower surfaces of the MLF/leads such as "etching", "drilling" or "stamping". Note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marrosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not . Note that applicant has the burden of proof in such cases, as the above case law makes clear. See also MPEP 706.03(e).

5. Claims 2-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over the APA and Fukaya (US Pat. 5969411) as applied to claim 1 above, and further in view of Brown (US Pat. 4918511) and Masuda et al. (US Pat. 4862246).

Regarding claims 2-5, APA and Fukaya teach substantially the entire claimed structure as applied to claim 1 above, except a dimple/plurality of dimples being formed on the die pad, leads or tie bars for increasing the attachment strength between the MLFP and the EMC.

Brown teaches a LFP having a die paddle/pad (see 10 in Fig. 2-4) where the die paddle/pad has a plurality of grooves being formed on a top or bottom surface of the die paddle/pad including those along edges and four corners to reduce mechanical stress in the LFP, the grooves being in a form of dimples or slits (see 40b and 40 in Fig. 4 and Fig. 2/3 respectively; Fig. Col. 1, line 50- Col. 3, line 16).

Masuda et al. teach a LFP having a plurality of depressions/dimples in a die tab/pad, leads and tie bars (see 11 in 13, 10 and14 respectively in Fig. 3B) to improve resin adhesion and mechanical strength in the LFP (Fig. 1-3B; Col. 2, line 44- Col. 4, line 15).

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the dimple being formed on the die pad, leads or tie bars for increasing the attachment strength between the MLFP and the EMC as taught by Brown so that adhesion and bonding strength among the LFP, EMC and the chip can be improved and the stress can be relieved in the Fukaya and APA's MLFP.

6. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over the APA and Fukaya (US Pat. 5969411) as applied to claim 1 above, and further in view of Murata (US Pat. 6483184).

Regarding claim 6 and 7, APA and Fukaya teach substantially the entire claimed structure as applied to claim 1 above, except the MLFP having holes for firm solder connection at the tips of the leads, the holes having a diameter ranging from 50% to 95% of the width of the leads.

Murata teaches a resin sealed wire bonded package (Fig. 1A/1B) having a metal frame/leads being extended to peripheral sides of the package such that the leads (see 20, 22, etc. in Fig. 1B) have semicircular shape holes at the tips (see 30 in Fig. 1A/1B) where the holes are provided with solder to provide firm solder connection at the tips of the leads (Col. 5, lines 45-62; Col. 4, line 60- Col. 7, line 19; Col. 2-7). Such holes have dimension/diameters being less than width of the leads (see Fig. 1B; Col. 3, line 5).

Furthermore, parameters such as length/width and thickness of leads, number of leads, diameter of through-holes in a substrate, number of through-holes, spacing/pitch, and a range of such dimensions in chip/LFP packaging and encapsulation technology art is a subject of routine experimentation and optimization to achieve the desired package dimension, weight, bonding strength, reduced level of mechanical/thermal stress and improved reliability and performance.

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the MLFP having holes for firm solder connection at the tips of the leads and select the holes having a diameter ranging from 50% to 95% of the width of the leads as taught by Murata so that the adhesion and bonding strength for an external connection can be improved and the stress can be relieved in the Fukaya and APA's MLFP.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number is 571-272-1663. The examiner can normally be reached on 09:00AM-05:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Nitin Parekh

NP

09-20-04

NITIN PAREKH

PATENT EXAMINER

Technology Center 2800